

Retrospective short-term forecasting experiment in Italy based on strong foreshocks

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In a recent work we computed the relative frequencies with which strong shocks ($4.0 \leq Mw < 5.0$), widely felt by the population were followed in the same area by potentially destructive main shocks ($Mw \geq 5.0$) in Italy. The frequencies vary from less than 1% to about 25% percent, depending on the magnitudes of the shocks and the time windows considered (ranging from minutes to a couple of years). In particular if the main shocks do not occur, the frequencies decrease anyhow to less than one percent after about 3-6 months after the strong shock. Assuming the stationarity of the seismic release properties, such frequencies can be tentatively used to estimate the probabilities of potentially destructive shocks after the occurrence of future strong shocks. This allows us to set up a testable alarm-based forecasting hypothesis based on strong foreshocks ($Mw = 4.5 \pm 0.25$) by the analysis of the HOMogenized instRumental Seismic catalog (HORUS) of Italy from 1960 to present. The retrospective testing over a tessellation of Italian territory with circles of radius $R=30$ km and a time window of 3 months, indicates area skill scores of 0.674 ± 0.001 for target shocks with $Mw \geq 5.0$, 0.832 ± 0.004 for $Mw \geq 5.5$ and 0.823 ± 0.006 for $Mw \geq 6.0$ significantly larger than the average unskilled score of 0.5. The prospective verification of such hypothesis will be possibly submitted to the testing facilities of the Colaboratory Study of Earthquake Predictability (CSEP).